

THE SOUTHERN EXTENSIONS OF *TSUGA MERTENSIANA* (MOUNTAIN HEMLOCK) IN THE SIERRA NEVADA

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The distribution and habitat preference of the most southerly extensions of *Tsuga mertensiana* (Bong.) Carr, commonly known as mountain hemlock, have never been fully documented. A dominant element of the subalpine forest to the north, the mountain hemlock in the southern Sierra Nevada of California is confined to scattered stands at elevations above 9,000 feet. At this end of its range the tree shows a strong preference for cooler, north-facing, granitic slopes, being commonly found in small compact stands at the heads of north or east-facing canyons or in sheltered ravines where snow lingers well into summer (Storer and Usinger, 1963).

Available literature, herbarium records, and communication with persons familiar with the high country of California indicated that the most southerly extension of *T. mertensiana* would be found in the southern part of Kings Canyon National Park. An intensive field search in this and adjacent areas of the High Sierra produced knowledge of a total of five distinct stands, three in Fresno County and two in Tulare County, which almost surely represent the most southerly outposts of this subalpine species. A reference by Sudworth (1908) to mountain hemlock in the San Jacinto mountains remains unverified and doubtful; this very possibly represents a *Pinus flexilis* location.

The five sites can be localized as follows (see fig. 1):

I. Silliman Creek (36°38'N; 9,650–9,800 ft. elevation). A small stand (50–70 individuals) of trees is located on the south side of Silliman Creek, about ½ mile below Silliman Lake on the northern border of Sequoia National Park (Triple Divide Pk. quad). Noted by Pusateri and Marshall in 1943 (personal communication) the Silliman Creek stand appears to be the southernmost confirmed stand of *T. mertensiana*. It is the only stand to be found within Sequoia National Park and one of two within Tulare County.

II. Vidette Meadows (36°45'N; 9,200–9,800 ft. elevation). A stand of mountain hemlock exists on north to northeast facing slopes on the south side of Bubbs Creek in lower Vidette Meadows, Kings Canyon National Park (Mt. Pinchot quad). The stand extends down Bubbs Creek towards Junction Meadow for nearly a mile.

III. Sphinx Creek (36°45'N; 9,600–9,900 ft. elevation). This small stand occupies a north slope along one of the upper forks of Sphinx Creek (Triple Divide Pk. quad) in Kings Canyon National Park and just over the Fresno County line in Tulare County. Approximately eleven miles to the northeast of the Silliman Creek site, this stand is the second most southerly location.

IV. Avalanche Creek (36°45'30"N; 9,050–10,000 ft. elevation). The largest stand (several hundred individuals) of *T. mertensiana* encountered in the present study

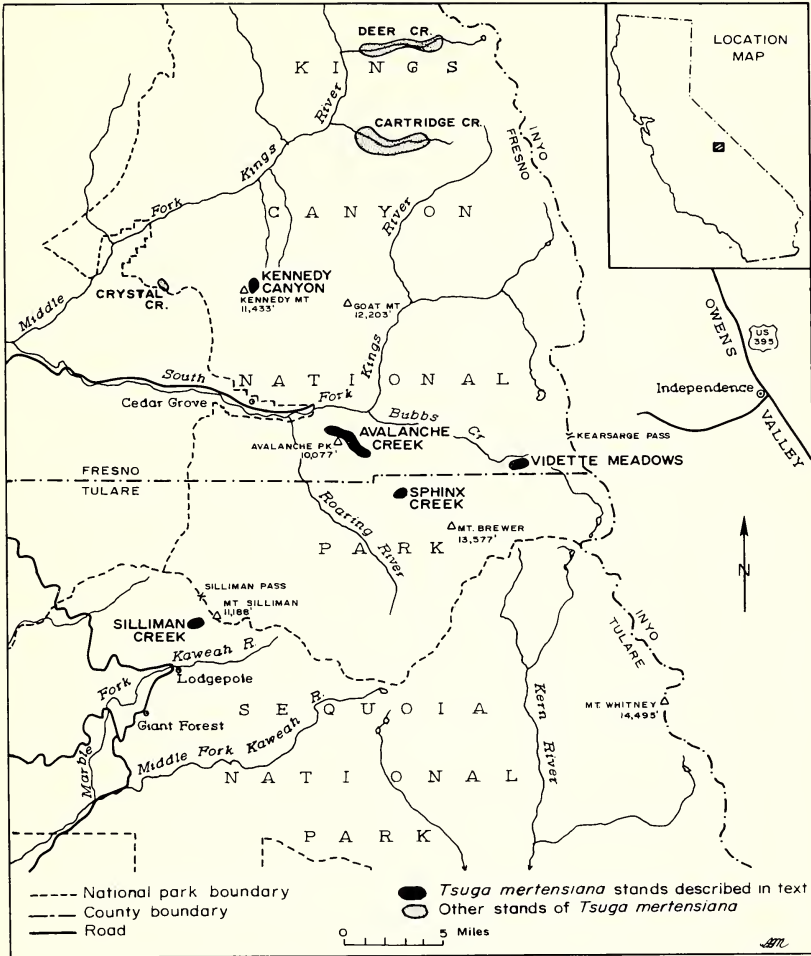


FIG. 1. Southern extensions of *Tsuga mertensiana* in the Sierra Nevada.

was found in the Avalanche Creek basin of Kings Canyon National Park (Marion Pk. quad), several miles to the west of Sphinx Creek site. This stand is located chiefly on north- to northeast-facing slopes.

V. Kennedy Canyon ($36^{\circ}53'N$; 9,550–9,750 ft. elevation). Nine miles northwest of the Avalanche Creek site a stand of over 100 trees was located at the head of Kennedy Canyon (Marion Pk. quad). Equidistant between the Middle and South Forks of the Kings River, the Kennedy Canyon site is about seven miles north of Cedar Grove. Situated chiefly on northeast slopes, this stand includes the largest individuals encountered in the study (Table 1).

The Silliman Creek stand lies within the Kaweah River drainage while those at Vidette Meadows, Sphinx Creek, and Avalanche Creek are in

the drainage of the South Fork of the Kings River. Northward, through the drainage of the Middle Fork of the Kings (e.g., Kennedy Canyon, Crystal Creek, Cartridge Creek and Deer Creek—see fig. 1), stands of mountain hemlock become more extensive and more numerous.

The above-mentioned southern outposts of mountain hemlock are all on the western slopes of the Sierra. Only as far south as the latitude of Bishop does the species cross to the east side of the Sierra crest. There is a stand of a few mature trees and several smaller ones some two miles south of Lake Sabrina (Mt. Goddard quad), Inyo County, in a fault fracture in the granite between Emerald Lakes and Topsy Turvy Lake ($37^{\circ}10'30''N$). This is apparently the highest occurrence of the species anywhere; the trees grow close to the 10,800-foot contour. A second stand (40 to 60 trees) lies a few miles to the north, immediately southeast of Horton Lake (Mt. Tom quad) at a latitude of $37^{\circ}19'30''N$ and at an altitude of 10,000 feet.

Among the topographic variables that appear especially to influence the southernmost distribution of mountain hemlock are elevation and aspect. The altitudinal range of the species in the areas concerned is remarkably narrow. It varies from 9,050 to 10,000 feet on the western side of the Sierra and 10,000 to 10,800 feet on the eastern side. Northwards the tree is found at gradually lower elevations and in greater abundance. The north-facing aspect of the slopes on which all stands were encountered protects the trees from the hot, drying effects of the mid-day summer sun. Such sites are also likely to hold a snow cover late into summer.

In all cases the trees were found growing on parent material of granitic origin. They were found only where substantial amounts of mineral soil were available, and seemed to prefer loose, coarse-textured soils that maintained moderate but not excessive amounts of moisture throughout the summer. The lush undergrowth of moss and wildflowers so characteristic of these southern stands of *Tsuga* are further evidence of the moisture conditions and high humus content of the soils that are associated with the species in these areas. Talus slopes found above each of the five localities appear to be important in optimizing habitat conditions for the species due to the resultant moistening of the soil by seep water that drains from the rocky surface above.

The mountain hemlock is able to achieve upright posture and large dimensions even at the southern extremes of its distribution (Table 1). Sequoia and Kings Canyon National Park files contain a photograph of a mountain hemlock "with an estimated diameter of 72 inches and a height of 150 feet" found at the head of Crystal Creek (fig. 1). It has been suggested that "the tree might be larger than the S.A.F. champion for the species" (personal communication; John McLaughlin, Park Superintendent). Farther north, where it occurs as a dominant tree, the mountain hemlock is seldom known to achieve heights as great as 150 feet or diameters over 65 inches. Further evidence of the apparent present ecological suitability of these southernmost sites for mountain hem-

lock is seen in the large number of healthy juvenile trees in each of the areas studied. Reproduction is clearly vigorous, even in the southernmost Silliman Creek location. However, the hemlock here is never in the pure stands so typical of more northern locations but instead is interspersed with such other subalpine conifers as *Pinus contorta*, *P. monticola*, *P. balfouriana*, or *Abies magnifica*.

TABLE 1. SELECTED GROWTH FORM MEASUREMENTS OF
TSUGA MERTENSIANA FROM ITS SOUTHERNMOST EXTENSIONS

Location	Needle length (inches)	Cone length (inches)	Maximum diameter (inches)	Maximum height (feet)
Silliman Creek	.60-.75	1.8-2.0	35.0	80
Vidette Meadows	.25-.70	1.0-2.5	43.0	99
Sphinx Creek	.75-.80	1.8-2.2	28.4	80
Avalanche Creek	.30-.60	1.8-2.8	30.2	85
Kennedy Canyon	.30-.60	2.0-2.5	39.5	100
Horton Lake	.50-.70	2.4-3.2	28.5	62

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LITERATURE CITED

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NOTES AND NEWS

HELEN M. GILKEY, 1886-1972.—Dr. Helen M. Gilkey, for many years a Professor and Curator of the Herbarium in the Department of Botany at Oregon State University, died recently at the age of 86. Dr. Gilkey moved to Corvallis in 1903, where she attended the university (then Oregon Agricultural College) and received her master's degree in 1911. In 1912, she entered the University of California, Berkeley, where she served as an illustrator for the departments of Botany and Physiology while working for her doctorate. She received the Ph.D. in 1915, submitting as her thesis a revision of the Tuberales of California, a work that was later published. Dr. Gilkey remained at Berkeley until 1918, when she moved back to Corvallis as an Assistant Professor and as Curator of the Herbarium. During her time at Corvallis, Dr. Gilkey continued as a world authority on the Tuberales and also authored or co-authored a number of books and articles on the flora of the Pacific Northwest, the most widely known being a Handbook of Northwest Flowering Plants, which went through several editions. She retired in 1951 and received the Distinguished Service Award of Oregon State University in 1969.